

IES Newsletter

Volume 17, Number 3
May - June 2000

New in the Perennial Garden this summer ...

Plant enthusiasts are showing a renewed interest in herbs, and IES is prepared with a renovated **herb garden**. A traditional four-corner design, this garden bed displays close to 40 varieties of herbs, some of which are sources of nectar for honeybees while others have medicinal and/or culinary uses and still others are popular for their fragrance alone. Perennial Garden visitors may help themselves to a plant list describing the uses of allium, rosemary, bergamot, thymes, mints and the many other herbs on display in the garden.

The **water garden** also shows off some new varieties this summer. In addition to assorted species of oxygenators and floaters, plants include: *Saururus cernuus*, lizard's tail; *Nelumbo nucifera*, sacred, or Chawan, lotus; three species of *Nymphaea*, water lilies; *Iris pseudacorus*, yellow flag iris; and canna lilies. Carnivorous plants thrive in the "pocket bog", and visitors who sit patiently on the garden's wall will also spot fish and aquatic insects.

The *IES Newsletter* is published by the Institute of Ecosystem Studies, located at the Mary Flagler Cary Arboretum in Millbrook, New York.

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Beavers as Engineers

A Native American legend holds that giant beavers gathered the mud to build the Earth.

Well, more than likely it didn't happen that way ... but these rodents – the second largest in the world, after the capybara from tropical South America – surely do mold the landscape. When beavers dam a stream to create a protective moat around their lodge, the resulting pond may be the most immediately recognizable modification of the environment but is far from being the only one. As trees are felled to build and maintain the dam and lodge, dormant seeds sprout and struggling plants flourish in newly bright sunlight. As rapidly flowing water is slowed by the beavers' architecture, water plants and insects move in; these insects, in turn, attract predators. A whole new environment is created.

Then, eventually, since beavers don't like to travel far to find the birch, aspen and willow they prefer as food and building material, they use up the resources around the pond. After they move on and are no longer doing daily repairs to the dam, it begins to fall apart and finally blows out. The pond drains and plants reclaim the once-flooded land; the marsh becomes a meadow and, over time, a forest once again.

Beavers are "ecosystem engineers", creatures that modify environments. Observers of the natural world have long been aware that animals and plants, in the course of doing what they do to survive, can transform ecosystems. Examples range from the oceans, where coral animals build reefs for their own needs and coincidentally create shelter for myriads of other marine organisms, to arid lands, where rock-eating snails in Israel's Negev Desert create soils that enable plants to grow. It was not until very recently, however, that Institute of Ecosystem Studies ecologist Dr. Clive Jones and IES adjunct scientists Prof. John Lawton¹ and Dr. Moshe Shachak² proposed a concept that has ecologists looking at ecosystems in a whole new way. This new concept addresses how organisms, from microbes to megafauna and flora, by modifying environments to meet their own needs, affect the availability of resources — sunlight, water, nutrients — to other organisms, thereby determining the fate of these organisms.

Mr. Justin Wright, one of Dr. Jones' graduate students, is studying how beavers affect patterns of plant diversity; quite possibly, he



IES graduate student Justin Wright studies meadows engineered by beavers.

is one of the first students anywhere whose thesis research focuses on an ecosystem from the perspective of its engineers. Working at abandoned beaver sites in the central Adirondack Mountains, Mr. Wright³ is surveying plants to see if certain species are better adapted than others to the engineered system. He expects this if that is the case, there will be higher numbers of species where beavers have colonized than there would be in a landscape that had not been engineered. He has estimated that in the central Adirondacks the presence of beaver-modified patches provides habitat for over 30% of the plant species found in the riparian zone (the area along a stream). This considerable effect of a single species on large-scale patterns of plant diversity is due to the fact that beavers create the only wetlands in the area, which allows many plants that would otherwise be excluded from the landscape to thrive.

Mr. Wright does his field research at the Huntington Wildlife Forest, which is a biological station run by the State University of New York College of Environmental Science and Forestry. The location is ideal because not only are there a lot of beavers, but also there are aerial photographs and data from annual biological surveys that will show how the habitat has changed over time. Mr. Wright is working in 20 meadows — all former beaver ponds — each with a stream running through it. In each meadow he lays transect lines to form grids 0.5 meters

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Science and Art in the Watershed

Wappinger Creek winds its way through Dutchess County, New York until it flows into the Hudson River. Among its numerous tributaries is a creek that runs adjacent to the Alden Place Elementary School in Millbrook. This little creek — not much more than a trickle, most of the time — normally might not be considered particularly interesting . . . but that would be only until you got to know it. And getting to know it is what the school's 4th and 5th graders are doing in an innovative watershed program jointly led by the Institute of Ecosystem Studies and local artist Laura Toonkel.

For teachers and students, the creek is a convenient and fun outdoor extension of the classroom. In 1997, the Millbrook Central School District received a Dutchess County Arts Council grant for the "Alden Place Watershed Project". Coordinated by then-IES educator Martha Cheo and Ms. Toonkel, whose credits include a series of paintings about wetlands, the program blended science and art to study and understand the local stream habitat as an ecosystem representative of a larger watershed. The project was funded again for school year 1998 and then for 1999; each year, educators have built on its science and successes to enhance the student experience.

There is an indoor classroom component to the Alden Place Watershed Project, and each class also takes two field trips across the schoolyard to the creek. The subject matter relates directly to the Millbrook Central School District science curriculum. IES educators work with 4th graders in their study of stream ecosystems and watersheds, with a focus on preservation, and provide each classroom with an aquarium teeming with stream plants, caddisflies, leeches and other fascinating creatures. With the 5th graders the IES team focuses on plants, helping students do transects to compare species across schoolyard dry meadow, wet meadow, and stream sediments. One of the things that the 5th grade classes investigate is the effects of the extremely invasive exotic purple loosestrife on the rest of the stream community, and during this past academic

year they collected data to try to determine why the plant is such a successful competitor. In one study, they investigated allelopathy, which is the inhibition of growth in one type of plant by chemicals produced by another type, and after measuring the growth of radish seeds planted in ground-up white pine, goldenrod and purple loosestrife, they found that white pine — not loosestrife — is the most allelopathic.

But scientific observation and experimentation aren't the only ways the Alden Place students learn about the creek ecosystem.



As part of the Alden Place Watershed Project, 5th graders in Mr. Yager's class collect data about plants that grow in and near a creek that flows next to the Alden Place Elementary School in Millbrook, New York. IES educators, including AmeriCorps member Michelle Wood, top left, help to coordinate and run the project.

They use their new science knowledge and their experiences in nature to create art, which, Ms. Toonkel explains, helps them learn to see beauty in the commonplace and ordinary. Fourth graders, under Ms. Toonkel's guidance, make accordion books in which they illustrate stream plants and animals and the food webs they have observed. Fifth graders make paper that they bind into journals in which to record their plant observations and data. Since the program began, Ms. Toonkel has expanded the art enrichment portion to include a local storyteller, Ms. Lorraine Hartin-Gelardi, and — for the entire elementary school — a program about the Hudson River and a performance by the Arm-of-the-Sea Theater called "City That Drinks the Mountain Sky".

During the 1999-2000 school year, science instruction for the Alden Place Watershed Project was coordinated by IES educators Joan Doyle, Program Leader in Ecology Education, and AmeriCorps member Michelle Wood; AmeriCorps members Amy Brush (also at IES), Rachel Fleishman and Amy Burns, together with Ms. Toonkel and a number of parent volunteers, also assisted with the program. "In the Alden Place Watershed Project," says Ms. Toonkel, "the Institute of Ecosystem Studies, Millbrook Central School District administrators, artists, teachers, parents, AmeriCorps members and Alden Place students come together with their different resources and talents — everyone connects to create greater awareness about the environment."

* * * * *

The Alden Place Watershed Project is made possible by funding provided by the Dutchess County Arts Council Arts in Education Program, with support from the New York State Council in the Arts, the Millbrook Central School District and the Millbrook P.T.O. ●

IES Trustees Appoint Dr. Likens to the Hutchinson Chair

At its spring meeting, the Institute of Ecosystem Studies Board of Trustees named IES Director Gene E. Likens as the first to hold the G. Evelyn Hutchinson Chair in Ecology. Ms. Gretchen Long Glickman, Board Chairman, made the announcement: "Gene Likens, like G. Evelyn Hutchinson, has been one of the foremost ecologists of the century. Dr. Likens' ecological research is of extraordinary importance. His leadership and vision for the Institute are truly outstanding. The Board of IES is very proud to make this appointment."

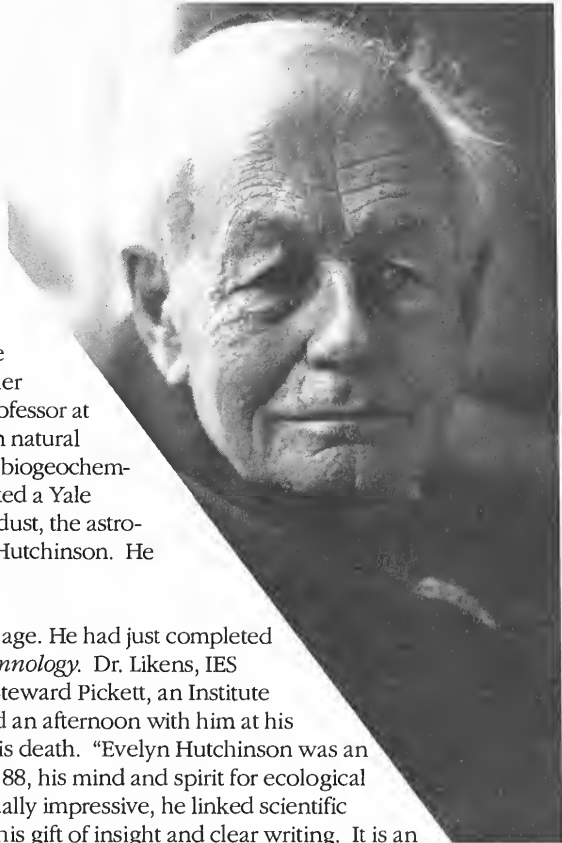
One of the two goals of the recently completed *Capital Campaign for the Institute of Ecosystem Studies*, the G. Evelyn Hutchinson Chair is the first endowed chair at IES. Endowed chairs are most frequently found at major research universities, where they honor not only the person or organization for which they are named, but also the individual designated to hold the chair. The G. Evelyn Hutchinson Chair was created to be held by a distinguished senior staff scientist, and Dr. Likens, Director of the Institute since he founded it in 1983, is uniquely qualified to be the first to occupy it. His four decades of research on the ecological relationships that help to determine the quality of our environment have earned him ecology's top honors. These include the 1994 Australia Prize for Science and Technology, the Tyler Prize (The World Prize for Environmental Achievement), the Ecological Society of America Eminent Ecologist Award, and the R.A. Vollenweider

Award and Lectureship in Aquatic Sciences, granted annually to an eminent freshwater scientist for global contribution to advancement of aquatic sciences.

G. Evelyn Hutchinson (right) was also an eminent ecologist, arguably the most influential ecologist of the twentieth century. A limnologist, his specialty was freshwater biology and chemistry; his four treatises on limnology are classics in the discipline. He immersed himself in other scientific disciplines as well, and as a professor at Yale University he developed courses in natural history, general ecology, limnology and biogeochemistry. Once, when a physics student asked a Yale astrophysicist a question about cosmic dust, the astrophysicist answered, "Go see Professor Hutchinson. He knows a lot about everything."

Hutchinson died in 1991, at 88 years of age. He had just completed the fourth volume of his *Treatise on Limnology*. Dr. Likens, IES Administrator Joseph Warner and Dr. Steward Pickett, an Institute ecologist, had the opportunity to spend an afternoon with him at his home in New Haven not long before his death. "Evelyn Hutchinson was an exceptional scientist," says Likens. "At 88, his mind and spirit for ecological inquiry were sharp and inquisitive. Equally impressive, he linked scientific processes to other disciplines through his gift of insight and clear writing. It is an honor to be the first to hold the chair bearing his name at IES."

The Hutchinson Chair endowment income frees up funds to enable the Institute to add another scientist to its staff. IES is committed to taking active steps to improve diversity, both at IES and in the field of ecology as a whole, and Dr. Likens said that a diversity-focused search for a staff ecologist will be carried out during the next academic year. ●



YALE UNIVERSITY OFFICE OF PUBLIC AFFAIRS

Beavers, from page 1

(approximately 20 inches) on a side, then randomly selects 50 of these grids and identifies all the plants in each. On a good

day, he can cover two meadows. Happily, Mr. Wright enjoys identifying plants, and reports that of the approximately 90 different species he has found in the meadows, approximately 10 are common; among them are a number of grasses and sedges.

Plants in engineered meadows grow in soil that has been enriched by sediments that accumulated behind the beaver dam, and they also benefit from increased light and moisture. Mr. Wright compares these plants with those from riparian zones in forested areas upstream. In the meadows themselves, he contrasts age, size, microtopography and nutrient availability to learn which factors control plant diversity.

"Ecosystem engineering closes a loop that hasn't been well studied in ecology," Mr. Wright says, "and using engineering as a way to organize and approach a subject offers a fresh perspective." He cites the example that while beavers like to eat alder, they also create the type of environment in which

alder thrive. "Since alders are nitrogen-fixing plants, the soil in which they grow becomes nitrogen-rich and this has a positive impact on some species. This could be what is more important to the ecosystem," he concludes. ●

1. Prof. John Lawton was an IES adjunct scientist from 1991-1999, during which time he collaborated with Drs. Jones and Shachak on this and a number of other theoretical and experimental issues in ecology. Prof. Lawton is chief executive of the Natural Environment Research Council in the United Kingdom.

2. Dr. Moshe Shachak, an IES adjunct scientist since 1990, studies desert ecology and ecological management at Ben-Gurion University of the Negev in Israel.

3. Mr. Justin Wright is a doctoral student at Cornell University, in the Division of Ecology and Evolutionary Biology. Mr. Wright will be completing his field research this summer, and hopes to defend his thesis by spring 2002.

Science and art connect for adult students as well, in IES Continuing Education Program Natural Science Illustration classes.

This pen-and-ink drawing of a beaver is by Christopher Giam, natural science illustrator and instructor in the IES program.



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Newsletter

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Calendar

CONTINUING EDUCATION

For **summer 2000** program information, or to request a catalogue, call the Continuing Education office at 845-677-9643. Programs during July and August are:

Gardening

July 11: **Superior Plants for Shady Borders**

July 15: **Invasive Exotic ID and Control**

Aug. 2 (4 sessions): **Fundamentals of Gardening**

Landscape Design

Aug. 5: **Residential Design Sketch Exercises**

Natural Science Illustration

July 12: **Garden Perennials - Pencil Drawing Workshop**

July 25-27: **Bugs and Beasts - Pen & Ink with Color Wash**

July 25-27: **Bugs and Beasts - Carbon Dust Technique**

July 28: **Wethersfield: Sketching on Location**

Biology and Earth Science

July 8: **Tree Identification: Field Course**

July 29: **Wild Plant Identification: Mid-summer**

Nature Crafts

Aug. 12: **Printing from Nature**

Ecological Excursions and Garden Tours

July 21: **A Tour of Stonecrop**

July 22: **Gardens of Chinese Inspiration:**

Innisfree and Naumkeag Moon Gate Garden

Aug. 11: **Canoe Tivoli Bay**

The **fall semester** catalogue will be available in August.

GROUP TOURS

We offer **guided tours** of the Perennial Garden, Fern Glen or Greenhouse, or a general overview of the Institute, for garden clubs, horticulturists, community groups, student organizations and other groups. Tours should be arranged four weeks in advance.

For information on fees, or to make reservations, call Ms. Su Marcy at 845-677-7641.

IES SEMINARS

Free **scientific seminars** are held each Friday from September until May.

VOLUNTEER OPPORTUNITIES

Current needs include:

Perennial Garden, Fern Glen: working side-by-side with IES gardeners is a great learning experience!

The Ecology Shop: weekday and weekend visitor orientation and/or customer assistance

Office/Laboratory: word processing, data entry
Call Ms. Su Marcy at 845-677-7641

THE ECOLOGY SHOP

New in the Shop ... enameled flower jewelry ... J.W. Stannard chimes ... **local crafts ...** pierced lamps and shades by Margaret Mihalyfi ... photo notecards by Linda Hubbard ... woven wheat straw ornaments by Cathy Gorham ... wrought iron plant hangers by Dennis Marcy ... **for children ...** a new batch of Folkmanis puppets ... **in the Plant Room ...** planters and pots ... rain gauges and sprinklers ... decorative garden stakes
Senior Citizens Days: 10% off on Wednesdays

- *Gift Certificates are available* •

HOURS

Summer hours: April 1 - September 30
Public attractions are open Mon. - Sat., 9 a.m. - 6 p.m. & Sun. 1-5 p.m., with a free permit. (Note: The Greenhouse closes at 3:30 p.m. daily.)
The Ecology Shop is open Mon.- Fri., 11 a.m.-5 p.m., Sat. 9 a.m.-5 p.m. & Sun. 1-5 p.m. (The shop is closed weekdays from 1-1:30 p.m.)
• *Free permits are required for visitors and are available at The Ecology Shop or the Education Office before 5 p.m. daily.*

GREENHOUSE

The greenhouse is a year-round tropical plant paradise and a site for controlled environmental research. The building is open until 3:30 p.m. with a free permit (see HOURS).

MEMBERSHIP

Join the Institute of Ecosystem Studies. Benefits include subscription to the newsletter, member's rate for courses and excursions, a 10% discount on IES Ecology Shop purchases, and participation in a reciprocal admissions program. Individual membership: \$30; family membership: \$40. Call the IES Development Office at 845-677-5343.

The Institute's Aldo Leopold Society

In addition to receiving the benefits listed above, members of The Aldo Leopold Society are invited guests at spring and fall IES science updates. Call the IES Development Office at 845-677-5343.

TO CONTACT IES ...

(Note that our area code is changing to 845. However, due to technical matters too complicated to go into here, for the time being the area code for the fax machines will remain 914.)

... for research, graduate opportunities, library and administration:

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Tel: 845-677-5343 • Fax: 914-677-5976

Street address: Plant Science Building,
Sharon Turnpike (Rte. 44A), Millbrook, N.Y.

... for education, general information and The Ecology Shop:

Institute of Ecosystem Studies
Education Program, Box R
Millbrook NY 12545-0178

Tel: 845-677-5359 • Fax: 914-677-6455

The Ecology Shop: 845-677-7649

Street address: Gifford House Visitor and
Education Center, Sharon Turnpike (Rte. 44A),
Millbrook, N.Y.

... **IES Website:** www.ecostudies.org

For information on current IES public events and attractions, visit: www.ecostudies.org/welcome/ThisWeek.html.

For garden tips, follow the link to the Perennial Garden Archives.